

CLAIMS

What is claimed is:

1. An odor-releasing ink-jet ink comprising:
 - 5 (a) an ink vehicle;
 - (b) an effective amount of an electro-thermal material dispersed within the ink vehicle; and
 - (c) an effective amount of an odor-releasing additive within the ink vehicle wherein an odorant is
- 10 releasable from the odor-releasing additive upon activation of the electro-thermal material.
2. An odor-releasing ink-jet ink as in claim 1 wherein the odor-releasing additive is a microparticle-
- 15 containing the odorant.
3. An odor-releasing ink-jet ink as in claim 2 wherein the microparticle is a pigment solid.
- 20 4. An odor-releasing ink-jet ink as in claim 2 wherein the microparticle is selected from the group consisting of cationic resins, anionic resins, and nonionic resins.
- 25 5. An odor-releasing ink-jet ink as in claim 1 wherein the odor-releasing additive is an electrochemical hydrogel containing the odorant, said odorant being releasable from the hydrogel upon substantial activation of the electro-thermal material.
- 30 6. An odor-releasing ink-jet ink as in claim 5 wherein the hydrogel is formed by a polymeric member selected from the group consisting of polyacrylamide-

methacrylate polymers, styrene-ethylene/butylene-styrene triblock polymers, ionic polymer-metal composites, poly(vinyl alcohol)-poly(acrylic acid) polymers, and combinations thereof.

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7. An odor-releasing ink-jet ink as in claim 5 wherein the odorant is contained within a solution, and is released as the hydrogel deswells due to electrical or thermal activation of the electro-thermal material.

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8. An odor-releasing ink-jet ink as in claim 5 wherein the hydrogel is encapsulated.

9. An odor-releasing ink-jet ink as in claim 1
15 wherein the odor releasing additive is encapsulated in a vesicle or liposome comprising a lipid surfactant having a hydrophilic end and a hydrophobic end.

10. An odor-releasing ink-jet ink as in claim 9
20 wherein the lipid surfactant is a fatty acid phosphate ester.

11. An odor-releasing ink-jet ink as in claim 1
wherein the odorant is selected from the group consisting
25 of vanillin, menthol, eugenol, and thymol.

12. An odor-releasing ink-jet ink as in claim 1
wherein the electro-thermal material is present in the
odor-releasing ink at from 5% to 15% by weight.

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13. An odor-releasing ink-jet ink as in claim 1
wherein the electro-thermal material is selected from the
group consisting of carbon-conductive materials, metal

powders, precious-metal powders, ferro-alloys, semiconductive graphite carbon, organic metals such as polyanilines, and combinations thereof.

5 14. An odor-releasing ink-jet ink as in claim 1 wherein the electro-thermal material is a salt containing ion selected from the group consisting of ammonium, sodium, potassium, nitrate, nitrite, lithium, chloride, acetate, phosphate, sulfonate, and combinations thereof.

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15 15. An odor-releasing ink-jet ink as in claim 1 wherein the odor-releasing additive is present in the odor-releasing ink from 0.1% to 10% by weight.

15 16. An odor-releasing ink-jet ink as in claim 1 wherein the odor-releasing additive is selected from the group consisting of microencapsulated odor-releasing agents, swellable odor-releasing agents, particulate odor-releasing agents; cationic, anionic, or non-ionic
20 resin odor releasing agents, and combinations thereof.

25 17. An odor-releasing ink-jet ink as in claim 1 wherein the electro-thermal material is physically or chemically bonded to the odor-releasing additive.

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18. A method of releasing an odor from a printed image comprising:

(a) providing a substrate having printed thereon an image comprising an electro-thermal odor-releasing ink;
30 (b) providing an energy source; and
 (c) completing a circuit between the electro-thermal odor-releasing ink and the energy source, thereby releasing an odor.

19. A method as in claim 18 wherein the energy source is a battery or other portable electrical storage device.

5 20. A method as in claim 18 wherein the energy source is heat.

21. A method as in claim 18 wherein the circuit is completed by a switch.

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22. A method as in claim 18 wherein the circuit is completed by electrically coupling the energy source to the electro-thermal odor-releasing ink with a conductive element.

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23. An odor-releasing article comprising:

(a) a substrate; and

(b) an image adhered to the substrate, said image being electro-thermally conductive, and said image
20 containing or contacting an odor-releasing substance, wherein upon electrical or thermal activation of the image, an odorant is released from the odor-releasing substance.

25 24. An odor-releasing article as in claim 23 wherein the substrate is paper.

25. An odor-releasing article as in claim 23 further comprising an energy source for activating the
30 image.

26. An odor-releasing article as in claim 23 further comprising a porous protective coating over the image.

- 5 27. An odor-releasing article as in claim 23 further comprising a non-porous protective coating configured for removal prior to activation.